that it is not certain that the species of *Mespilus* entering into the foregoing chimaera is immune, and even if it were, the result of the experiment does not imply that the *Mespilus* epidermis had become susceptible, since it is known that germ tubes of fungi frequently penetrate inert membranes and even the epidermis of plants in whose tissues they are unable to make any further growth.

ORTON[9] describes a number of cases of correlation in the distribution of certain heteroecious species of *Puccinia* and *Uromyces*. The forms thus correlated have for their telial hosts the same species or closely related species of the same genus, while their aecidia occur on alternate hosts which are either identical or which are species of one genus. The aecidia and the uredospores of the associated rusts are similar in structure, form, and color, while the teleutospores differ only in number of cells. As examples may be cited *Puccinia subnitens* and *Uromyces Peckeanus*, both of which occur on *Distichlis spicata* and have aecidia similar in their essential characteristics on species of the Chenopodiaceae; also *Puccinia Caricis-Asteris* and *Uromyces perigynius* with teleutospores on species of *Carex* and aecidia on members of the Compositae. This condition appears to point to a close relationship between the two genera *Puccinia* and *Uromyces*.

In opposition to the view that rust-infected grains of cereals are the agencies by which the grain rusts are carried over from year to year, ERIKSSON[10] points out that grains bearing rust pustules are, both in his own experiments and according to statements in the literature, of very rare occurrence; and that plants developing from such grains do not become infected earlier nor more severely than plants from normal seeds. Furthermore, a cytological study of a large number of plants from plots which afterward were badly rusted failed to show the presence of mycelium by means of which the rust might have lived through the winter. He concludes, therefore, that the rust pustules on infected seed grain are of no significance in connection with the rust of the grain crop.—H. HASSELBRING.

Chloroplasts and chlorophyll.—LIEBALDT'S work[11] on chloroplasts emphasizes again the important part colloidal chemistry is coming to play in physiological problems. The chloroplast is considered a two-phase disperse system. The pigments, especially the green ones, constitute the lipoid phase, and the stroma, insoluble in lipoid solvents, coagulable with heat and alcohol, and swelling in water, is the hydroid phase. The lipoid phase shows amicronic (in particles beyond the vision of the ultramicroscope) dispersal through the

---

[9] ORTON, C. R., Correlation between certain species of *Puccinia* and *Uromyces*. Mycologia **4**:194–204. *pls. 2.* 1912.

[10] ERIKSSON, J., Rostige Getreidekörner- und die Überwinterung der Pilzspecies. Centralbl. Bakt. II. **32**:453–459. 1912.

[11] LIEBALDT, ERNA, Über die Wirkung wässeriger Lösung oberflächenaktiver Subitanzen auf die Chlorophyllkörner. Zeitsch. Bot. **5**:65–113. 1913.

hydroid phase, hence the chloroplast is generally homogeneous when viewed with either the microscope or the ultramicroscope. The hydroid phase of the chloroplast absorbs considerable additional water when it is brought into direct contact with this agent. This disturbs the dispersion of the two phases and the green pigment accumulates in various regions, giving the plastid a granular appearance. This, the writer believes, is not a complete separation of the two phases, for the green granules are not as dark colored as the separate drops of the pigment, and the lipoid phase will not strain with Sudan III nor the hydroid phase with neutral red, both of which occurs in a true separation of the two phases. Water solutions of various alcohols in concentrations too low to coagulate the hydroid phase hasten and accentuate the deformation caused by distilled water, but do not cause a true separation of the two phases. If the alcohol is sufficiently concentrated to coagulate the hydroid, a complete separation occurs. In this process the separation of the pigment passes from amicronic dispersal through submicronic (particles visible to the ultramicroscope but not to the microscope) and micronic (visible to the microscope) to complete separation. This work gives quite a different picture of the relation existing between stroma and pigments in the normal chloroplast from that generally depicted in texts. The texts generally speak of the pigment being held in the meshes of the spongy stroma or aggregated in the outer layers of the plastid. The author can gain either of these pictures by one or another method of deformation. He does not deny that such a deformation occasionally occurs even in the living active cell, but the chloroplast is generally homogeneous and shows amicronic distribution of the two-phase system. This agrees with the dispersal of the various phases in the protoplasm which is optically empty aside from the microns in it. Plastids of the various plant groups vary in their consistency and resistance to agents; those of the Florideae are most nearly liquid.

By use of alcohols as solvents, the author was able to obtain crystals of the green pigments from many green plants, ranging from the algae up. The form and structure of the crystals vary with the alcohol used. The advance of our knowledge of the chemistry of chlorophyll during the last half-decade enables us to state with reasonable certainty the general constitution of the green pigments as they exist in the plastid, also of the crystalline products in methyl and ethyl alcohol. TSWETT's contention that there are two green pigments (termed by him α and β chlorophyllin) has been confirmed by WILLSTÄTTER, who has shown that they are different oxidation stages of the same substance. According to this writer one of them can be represented as follows:

$$C_{31}H_{29}N_4Mg \begin{cases} COOH \\ COOCH_3 \\ COOC_{20}H_{39} \end{cases}$$

The molecule bears three carboxyl groups. One is free, another bears a methyl group, and the third a phytol group. In extraction with ethyl alcohol the

phytol group is displaced by the ethyl group and the ethyl derivatives crystallize out. With methyl alcohol the crystals are the methyl derivatives. WILLSTÄTTER speaks of the native green pigments as phytylchlorophillids. On the same basis the ethyl derivatives are ethylchlorophillids. The displacement of the phytol by the ethyl group is hastened by an esterase (chlorophyllase). The phytyl derivatives are amorphous, while the ethyl and methyl derivatives are crystalline. The constitution of the green crystals given with ketones, esters, and aldehydes is unknown.—WM. CROCKER.

Silver leaf.—GÜSSOW[12] reports that the peculiar disease known as "silver leaf" is common on fruit trees in Canada. This disease has been recognized and has received distinctive names in several European countries. Its chief symptom, as its name indicates, is a silvery appearance of the leaves which is brought about by the separation of the epidermis from the palisade cells and the consequent filling of the resulting space with air. The wood of the diseased trees is browned and contains mycelium. After the death of the affected trees, fruit bodies of *Stereum purpureum* develop on the trunks and branches. This fungus has been shown by PERCIVAL, PICKERING, and others to be causally associated with the disease. The observations of these investigators are confirmed by GÜSSOW's experiments in Canada, where in many cases he was able to produce the disease in 100 per cent of the inoculated trees. He also found that scions grafted on diseased trees soon became infected. In all cases the wood is infected with the mycelium of *Stereum purpureum*, but the most striking feature of the disease is the total absence of the mycelium from the diseased leaves. The mode in which the separation of the epidermis from the underlying tissue is brought about by the fungus was not determined. The disease appears to furnish an example of physiological effects wrought by the action of the mycelium on parts of the host not actually invaded. Such phenomena, where the effects cannot be traced to mere mechanical injury, are practically unknown in the field of plant pathology.—H. HASSELBRING.

Cytology of Laboulbeniales.—As a sequence to his general introductory account[13] of the cytology of the Laboulbeniales, FAUL[14] has published a full account of the special morphology of two species, *Laboulbenia chaetophora* and *L. Gyrinidarum*. These two forms lack antheridia; therefore the study of them is not complicated by the question of fertilization by spermatia. The young procarp consists at first of the carpogonium, the trichophoric cell, and the trichogyne. The nucleus of the carpogonium and that of the trichophoric cell divide, and at about the same time the wall between the two cells

[12] GÜSSOW, H. T., Der Milchglanz der Obstbäume. Zeitschr. Pflanzenkrank. **22**:385–401. *figs. 1. pls. 2.* 1912.

[13] Rev. in BOT. GAZ. **54**:84. 1912.

[14] FAUL, J. H., The cytology of *Laboulbenia chaetophora* and *L. Gyrinidarum*. Ann. Botany **26**:325–355. *pls. 4.* 1912.